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Exact neutrino mixing angles from three subgroups of SU(2) and the physics consequences

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Neutrino mixing may be the most important clue revealing that the 3 lepton families actually represent the different but related discrete symmetries of 3 specific finite groups. This clue could be interpreted to not add a single horizontal flavor symmetry but to have each lepton family represent a different finite subgroup of the electroweak SU(2) x U(1), thereby staying within the realm of the present successful Standard Model gauge group. If so, only five possibilities exist: the subgroups 2T, 2O, 2I, D2n, Cn (n odd), of the unit quaternions. The first three are binary polyhedral groups with three generators each and 24, 48, and 120 group elements for operations in a 3-D real space R^3. The assignment of 2T to the electron family, 2O to the muon family, and 2I to the tau family flavor states allows one to use their generators to calculate the neutrino mixing angles θ12 = 34.281°, θ23 = 42.859°, and θ13 = -8.578°, by making these three binary groups act together in combination to be equivalent mathematically to one SU(2) group and its three Pauli generators. If this assumption is correct, some important physics consequences seem to be dictated: exactly three lepton families exist; no sterile or fourth neutrino state is possible; the PMNS matrix is unitary; the normal neutrino mass state hierarchy is preferred; the neutrino CP phase angle can be 0° or -90° only; the muon and tau are not excited states of the electron; no neutrinoless double beta decay is expected because these are Dirac neutrino states; the lepton flavor states are defined in R^3 to suggest that leptons may not be point particles; and the Standard Model lagrangian may be viable down to the Planck scale. A first principles procedure to calculate the charged lepton and neutrino mass state values is yet to be determined.

Summary

A diiferent approach to the neutrino mixing angles produces exact values agreeing with experiment. Three different discrete symmetry subgroups of SU(2) combine their generators to mimic SU(2) as the fundamental reason for neutrino mixing. Many physics consequences follow directly. This method remains within the realm of the present Standard Model lagrangian without added horizontal symmetries.

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